------------------------ Submission 219, Review 4 ------------------------

Title: RCAnalyzer: Visual Analytics of Rare Categories in Dynamic Networks

Reviewer: primary

Paper type

System

Expertise

3 (Expert)

Overall Rating

<b>2 - Reject</b><br/> The paper is not ready for publication in VAST / TVCG.<br/>The work may have some value but the paper requires major revisions or additional work that are beyond the scope of the conference review cycle to meet the quality standard. Without this I am not going to be able to return a score of '4 - Accept'.

Supplemental Materials

Acceptable

Justification

The paper presents a system, RCAnalyzer, to visually explore network data

with a focus on tracking abnormal behavior. This is an interesting and

quite important topic in VAST. I however feel the paper is not strong

enough to make it for VAST. The contributions of the work are not those

the authors put forward (see review).

The Review

Paper 219 IEEE VAST 2017

RCAnalyzer:Visual Analytics of Rare Categories in Dynamic Networks

The paper presents a system, RCAnalyzer, to visually explore network data

with a focus on tracking abnormal behavior. Abnormality is detected using

existing algorithms. The system offers a set of different views combining

adjacency matrix, Sankey diagrams, and a hierarchical structure based on

a multi-focus tree cut algorithm.

The BIRD algorithm unfortunately is not described in detail enough to

allow its re-implementation. The authors claim they have improved

previous version of the algorithm to deal with network dynamicity, but I

can't see how.

Answer:扩展描述BIRD算法的部分，详细描述BIRD算法，可能的话对BIRD算法进行改进。

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The authors write: "... we propose a novel visualization system called

RCAnalyzer, ..." while they classified their paper as

Technique/Algorithm.

The focus+context approach on matrices based on hierarchical clustering

is nothing new, although the use of a lense to visuallly eplore tha mtrix

could be viewed as original. See for instance:

Abello, J. and F. van Ham (2004). Matrix Zoom: A Visual Interface to

Semi-External Graphs. IEEE Symposium on Information Visualization, IEEE

CS Press, 183-190.

Answer: 修改introduction中贡献的写法以及后文树切割算法的描述，重点突出多焦点多粒度的focus+context交互方式，而非简单的focus+context。在related work中添加focus+context的工作，并进行比较。

The multi-focus cut algorithm is interesting although the author do not

motivate its definition. I see there ideas borrowed form the different

DOI definitions used in the literature mixed with a dose of subgraph edge

density. The tree cut algorithm is presented as a main contribution of

the paper. I however lack motivation for its definition and most of all

lack a clear comparison with alternative approaches -- this would be

needed to make it a core contribution of the paper.

Answer: 在文中添加对多焦点多粒度分割方式的动机的解释。

The edge crossing minimization approcha suffers from the same problem. I

am ready to believe that the authors indeed needed to design their own

algorithm -- but I am not ready to believe that a greedy approach to

crossing minimization is a core contribution in a VAST paper.

Answer: 没道理

Te system design part misses the most important ingredients: it should

discuss how the design indeed supports the targeted tasks, and highlight

how the tasks were modeled and led to the design choices. As is, I only

see a series of section describing system components.

Answer:在system design中把设计是如何支持分析任务的部分单独提出来写，并把design choices单独成一个黑体加粗的小段来写。

The user experiment is interesting and actually reassuring. The

experiment is however not described in detail enough. Questions are built

around the identification of rare categories -- but if I understood well,

the system does the identification for the users. I am not sure what is

evaluated here.

Answer:增加对user study的细节描述。

All in all, the paper is a bit rough, with everything put on the table

often missing proper motivation and explanation. I am unsure the core

contribution are properly identified by the authors. In my opinion,

-- the tree cut algorithm is not completely new

-- the connected triangle smatrices and focus\_context navigation neither

The system itself most probably is the main contribution. The paper

should however be rewritten from that angle, putting ore efforts in

preseting the system design approach with a clear task analysis properly

motivating the visual encodings and interaction that were put in place.

To conclude, I would ebcourage the authors to review their work before

resubmitting.

Typos:

Intro, p. 1 finding out those \*anomalous\* changing behaviors of network

structures \*is\* valuable.

p. 2 This is \*particulary\* difficult

p. 2 and \*rich\* (?) context representation

p. 2 in context of a big dynamic graph is \*a\* challenge

p. 2 "a multi-foc view" -- multi-foc ? multi-focus ?

p. 2 anomoly ???

Summary Rating

3 (<b>Possible Accept</b><br/> The paper is not acceptable in its current state, but might be made acceptable with significant revisions within the conference review cycle.<br/>If the specified revisions are addressed fully and effectively I may be able to return a score of '4 - Accept'.)

The Summary Review

Overall, the reviewers liked the idea of the paper, although they could

not agree on the paper type that was presented. This absence if consensus

reflects weaknesses that were underlined by reviewers (see reviews).

In the end, reviewers agreed that the paper might be accepted depending

on the quality of the overall papers that were submitted to the

conference this year. If there is room, the authors will get a chance to

rework their paper and resubmit for a second round. If not, they are

encouraged to indeed rework and strengthen their paper and contribution

and submit to a future venue.

Second round comments (public)

(blank)

Second round supplementary materials check

(blank)

Second round supplementary materials comments

(blank)

------------------------ Submission 219, Review 1 ------------------------

Title: RCAnalyzer: Visual Analytics of Rare Categories in Dynamic Networks

Reviewer: secondary

Paper type

Technique and Algorithm

Expertise

3 (Expert)

Overall Rating

<b>2 - Reject</b><br/> The paper is not ready for publication in VAST / TVCG.<br/>The work may have some value but the paper requires major revisions or additional work that are beyond the scope of the conference review cycle to meet the quality standard. Without this I am not going to be able to return a score of '4 - Accept'.

Supplemental Materials

Acceptable with minor revisions (specify revisions in The Review section)

Justification

The idea of visualizing automatically detected anomalous events in

dynamic graphs promises to increase the scalability and power of

visualization approaches. The proposed visual encoding of the data is up

to the state of the art. The core contribution of the submission is the

integration of the automatic detection into an analysis framework.

However, gaps in the explanation and weaknesses in the presentation do

not allow me to judge and evaluate the soundness and value of this core

contribution. The evaluation does not yet sufficiently demonstrate

usefulness of the approach. Hence, I need to argue for rejecting the

paper while hoping that a significantly revised future version of the

paper will clarify.

The Review

The submission introduces a technique to visualize dynamic networks with

a focus on anomalous events that appear in the structure of the changing

network. An algorithm called BIRD is tailored for the specific use case.

The detected anomalous events are then visualized as part of connected

adjacency matrices on a timeline. A clustering and tree cutting algorithm

collapse non-important parts of the graph. Further views provide an

overview on the full timeline and details on the detected events and

sub-networks. The approach is evaluated in two use cases, in a

quantitative user study with 12 participants, and a qualitative study

with two users.

I understand and agree with the general motivation of the approach. The

idea of automatically focusing the analysis of a dynamic network to

anomalous events is excellent and promising. Whereas the general message

is clear, I had a hard time understanding what the approach actually does

and what are its contributions. Parts of my confusion was caused by

unclear terminology, for instance:

\* Understanding “oracle” as somebody or something that makes

predictions, I thought it refers to some algorithm. Only very late, I

realized that the term most likely refers to the users of the system.

This term needs to be introduced and defined explicitly.

\* What does it mean “to label rare categories”? The term “to

label” is used both for the algorithm and the users/oracles. I assume

for the algorithm it means to assign a score, for the user to assign a

certain keyword identifying a type of rare event (e.g., a merge of

clusters). This needs to be clarified explicitly.

\* Also, the term “rare categories” is somewhat unclear to me. Does it

identify a graph node or a set of graph nodes? Is it related to a certain

time step or a time range? A formal definition would help.

\* I first thought “feature space” refers to feature vectors

describing meta-information of a node. However, it seem it denotes the

network of related nodes.

\* In graph visualization, it is uncommon to refer to the nodes/vertices

as “instances”. This causes unnecessary additional confusion.

Answer: 在background中加一小节介绍全文使用的术语，包括oracle，rare category等等。

The paper discusses all important areas of related work. I confirm that

the specific solution to focus on interesting changing graphs is novel.

However, the novelty is limited by two previous works, the first not

referenced at all, the second only listed but not discussed:

\* Reitz et al. (2009) apply a multi-focus concept to dynamic graph

visualization. It is based on a simpler definition of “anomalous

events” and uses animated node-link diagrams, but the general idea is

similar.

Reitz, Florian, Mathias Pohl, and Stephan Diehl. "Focused animation of

dynamic compound graphs." In Information Visualisation, 2009 13th

International Conference, pp. 679-684. IEEE, 2009.

\* Vehlow et al. [41] already combine matrices and Sankey diagrams to show

the evolution of graphs. Moreover, they highlight changes in the

hierarchies, which supports detecting certain rare events like splits or

merges.

Answer:在related work中添加Reitz et al.并进行比较，并详细描述我们的方法与Vehlow et al.的区别和优势。

Relying on existing algorithms to detect anomalous events makes sense.

However, the paper explains the BIRD algorithm poorly. Even after reading

the respective section several times (Section 3.1), I neither understand

what the algorithm considers as “rare”, how differences across time

steps are incorporated, what are the outcomes of the algorithm, nor how

the “batch” extensions of the algorithm work. Since the algorithm

builds the foundation of the work and its integration into the visual

analysis is the main contribution of the paper, this needs significant

clarification. At the moment I cannot judge whether the algorithm is

appropriate for achieving the goals, whether the extensions are

technically sound, and whether the integration is suitable. It seems that

the algorithm can only compare two time steps, which need to be first

defined by the user. Hence, the algorithm is not applicable to the whole

dynamic graph and detected patterns are limited to temporal differences

between exactly two points in time.

Answer: 扩展background中的BIRD算法描述，解释BIRD算法寻找的rare category是什么，给出算法的详细步骤。

A tree cut algorithm is important for the approach to focus the graph

representation to a smaller set of nodes without losing context. I

understand the basic idea of the approach, however, cannot follow the

detailed description fully because of missing definitions and

explanations. Are N\_i set of nodes or sets of edges (e \in N)? What does

“if \forall v \in e, v\in N” mean? What is the purpose of D(e,N) and

S(e,N)? I am not convinced that the second stage of the algorithm is

sound: reclustering the result as shown in Fig. 5 is misleading because

the new clustering is not compatible with the original clustering result.

Very similar layout optimization has already been discussed elsewhere -

related work should be referenced and discussed, for instance:

\* Dwyer, Tim, and Falk Schreiber. "Optimal leaf ordering for two and a

half dimensional phylogenetic tree visualisation." In Proceedings of the

2004 Australasian symposium on Information Visualisation-Volume 35, pp.

109-115. Australian Computer Society, Inc., 2004.

\* Fernau, Henning, Michael Kaufmann, and Mathias Poths. "Comparing trees

via crossing minimization." In International Conference on Foundations of

Software Technology and Theoretical Computer Science, pp. 457-469.

Springer Berlin Heidelberg, 2005.

\* Nöllenburg, Martin, Markus Völker, Alexander Wolff, and Danny Holten.

"Drawing binary tanglegrams: An experimental evaluation." In 2009

Proceedings of the Eleventh Workshop on Algorithm Engineering and

Experiments (ALENEX), pp. 106-119. Society for Industrial and Applied

Mathematics, 2009.

\* Byrka, Jaroslaw, K. Buchin, M. Buchin, M. Nollenburg, Y. Okamoto, R. I.

Silveira, and A. Wolff. "Drawing (Complete) Binary Tanglegrams: Hardness,

Approximation, Fixed-Parameter Tractability." Algorithmica (2010).

\* Vehlow et al. [41]

Answer: 添加对tree cut算法中公式的详细解释。参考review提出的文献对算法的第二步进行修正。

The general design and visual mapping of the visualization are clear and

readable. A combination of matrices and Sankey diagrams is suitable for

representing large dynamic graphs across a few time steps. Still, I see

room for improvement and there are issues in the presentation:

\* Using blue as background color for the cells, for the highlighting of

rows/columns as well as for encoding the edge weights is confusing and

decreases the readability of the graphs.

Answer: 修改矩阵视图的配色方案，在无信息的部分使用无色透明背景。

\* I do not agree in general that a “matrix has better traceability and

comparability for a sequence of networks”, but just under certain

circumstances. If the order of vertices changes and if added/removed

edges are not highlighted, the comparability of subsequent graphs is

rather poor. The connected hierarchies help to some extent preserve a

certain traceability, but it would be easier if the position of nodes

does not change at all. I am okay with using matrices with changing order

of vertices, but this central design decision needs to be motivated more

carefully.

Answer: 矩阵视图中选择矩阵作为基本表达的原因需要重新写。

\* In the hierarchy, it is hard to see what is currently expanded. Is it

possible to expand or collapse hierarchy nodes interactively?

\* What statistics metrics does the timeline view and on what basis were

they selected?

Answer: 层次结构的可视化需要重新考虑一下怎么做，目前的做法有点太简单直接，对层次展开的表达也不好。时间线视图需要详细写一下选择了哪些度量，以及选择这些度量的原因。

\* The kNN Distance Diagram is not introduced properly. The term “kNN”

is not explained and the distance measure is not defined - I assume it

refers to “k nearest neighbors” and the distance is the length of the

shortest path between two nodes. Does k refer to the number of elements

or the maximum distance allowed? Can the user specify k?

Answer: 详细描述kNN视图。

\* How does the matrix version of the ego network represent the difference

between two time steps? The text sounds as if this is possible, but I do

not find an example.

Answer: 这里可能漏写了，我们用颜色编码了边的增加和消失。但是节点的变化确实没有进行编码，需要考虑如何表达。

The video helps understanding the user interface, but plays too fast to

really follow the steps and read the text annotations.

Answer:重新录制视频。

I find the presented usage scenarios only mildly convincing. Studying

collaboration networks of researchers is a suitable scenario, but the way

the data is filtered poses a problem: Studying the co-author networks of

a single conference on a yearly basis is too fine-grained. Most ongoing

collaboration in the field do not result in a yearly IEEE VIS publication

- a missing connection does not mean that two researchers stopped

collaborating. Hence, it does not make sense to interpret merging and

splitting of clusters on that basis. To address the sparsity and gaps in

the data, I suggest to aggregate several years and rule out all authors

who have not published at least, for instance, three VIS papers. In the

second usage scenario, I do not understand what the network represents

exactly - this needs more explanation. Also, the results seem only to

refer to a static graph (a cluster of nodes) rather than a dynamic graph

(changing clusters of nodes). In general, I am not convinced yet that the

listed result of the two usage scenarios could not be detected with a

much simpler visualization, for instance, a matrix- or node-link-based

diff representation of the networks.

Answer: 考虑重新构建合作网络，拿vis领域中所有的文章构建一个合作网络；还可以多拿几个领域的文章再构建一个更大的合作网络代替目前使用的第二个数据集。Review所说的按照文章数过滤作者的方法也可以使用。

The user study is promising. I agree that it is better to work with

artificial examples where the correct solution is known. The achieved

accuracy rates seem to be high, but without a reference/baseline (or at

least showing some examples), it is hard to judge the difficulty of the

tasks (maybe, the solution was rather obvious and could have been

detected with many visualizations). In general, the provided material,

tasks, and results should be explained in more detail and threats to

validity need to be discussed.

Answer: 添加一个baseline系统（比如一个简单的节点链接图），或者在case study中加上人造数据，展示异常在系统中的样子。

I do not see much value in the expert study and suggest to delete it. It

stays unclear what domain the experts are from and why they are experts.

Further, what tasks did the users solve? What data did they work with?

How long did they use the tool? Did they use the tool on their own or

with considerable help? What questions did they answer? The discussion of

results read like marketing statements and are far from a thorough

qualitative analysis of user behavior and feedback.

Answer: 删除expert review，或者按照review的意见添加更多的细节。找几个专家，定一些任务，做一下expert review。

Minor comments:

\* Many typos and grammar issues - please carefully proofread

\* Strange hyphenation (single letters appear in a new line)

\* Missing spaces before parentheses

\* Figure 6: too small to be readable

\* References: check capitalization of names (e.g., “Small

Multipiles”)

------------------------ Submission 219, Review 2 ------------------------

Title: RCAnalyzer: Visual Analytics of Rare Categories in Dynamic Networks

Reviewer: external

Paper type

Application

Expertise

2 (Knowledgeable)

Overall Rating

<b>4 - Accept</b><br/> The paper should be accepted with some minor revisions.<br/>Once these have been completed it will meet the quality standard.

Supplemental Materials

Acceptable

Justification

This is a complex visual encoding with clever visual design and

algorithms that clearly address the requirements listed for this original

application of rare categories detection. The usability studies are not

totally convincing and some design choices are poorly justified. But the

accumulation of all these improvements to algorithms and visual encoding,

in a design that is consistent and very focused on the tasks and

challenges described, are probably enough to compensate for the

weaknesses. The paper needs a complete proof-reading.

The Review

The visual encoding of the main visualization is probably challenging for

the end user. It requires shifting mindset from node-link diagrams to

triangular correlation matrices, understanding the encoding of the node

sizing, which acts a bit like some orthogonal fisheye lenses, then the

various color encoding, the Sankey linking between multiple matrices on a

timeline and the hierarchical clustering trees. In this complex visual

encoding, some patterns can look significant but are not, like bundles in

the Sankey or clusters in the trees. Then there's the rest of the

interface, with some node-link diagrams, matrices, legends, with some

more encoding. And then there's the interaction that requires some fancy

scaling for zooming and dragging.

The paper is fairly convincing in justifying how a complex task with

specific design constraints need a complex visualization. But still, I

wonder if it could have been simpler. For example, the conclusion that

the task "cannot be achieved in node-link diagram" is not properly

justified. The choice for "timeline with matrix-based and flow-based

representation methods" is clearly stated, and, of all the paper cited,

MatrixWave is probably a good place to start this design exploration.

Maybe it would be worth mentioning some studies on linked visualizations,

like this one that has matrices and Sankeys: "Domino: Extracting,

comparing, and manipulating subsets across multiple tabular datasets".

But there should be more discussions of the rejected alternatives. For

example, I wonder how the correlation matrix approach would compare to

other mentioned in the cited "The state of the art in visualizing dynamic

graphs" or to some dynamic node-link diagrams like in "Hierarchically

Animated Transitions in Visualizations of Tree Structures" and some other

designs cited by the author. Visualizing dynamic graphs over time using

node-link diagram is definitely challenging, but it can be achieved, with

the advantage of staying close to a visual encoding that the study shows

that the target user prefers.

Answer: 在参考文献中加入Domino这篇文章，同时在related work中讨论文章提出的方法与已有方法的区别和优势。后文描述design时，单独对design alternatives进行讨论。

But this lack of discussion of alternatives is probably not a big problem

since this paper is less about designing new encodings than applying a

combination of them (matrix, Sankey, tree, node-link) to specific tasks

around visualizing and iteratively labeling rare categories in a dynamic

network in context. In that sense, the contributions are well presented

and all the adaptations to apply it to rare categories visual analysis

are clever: a tree cut algorithm for focus and context, some

modifications to the BIRD algorithm, Sankey crossing optimization, etc.

The algorithms are well explained, even if it assumes some prior

knowledge to be able to understand the task (e.g. "labeling oracles",

"ego network") and the visualization (correlation matrix, Sankey). Some

details could help less specialized users get onboard, like briefly

explaining how the challenge of detecting and visualizing rare categories

is different than detecting anomalies. There are some fields of

application mentioned, but specific examples could help, like what kind

of fraud or of network intrusion signal would be considered to be part of

a rare category. The intro image legend has a good example, but it could

be made more explicit than "BIRD detects W. D., X. W., and H. L. between

2014 and 2015", maybe by explaining upfront that it's a dynamic network

of co-authorship where we can visualize special co-authorship change

patterns over time detected as rare categories.

Answer: 解释异常检测和rare category之间的关系，需要点名active learning的特性。在introduction中或是后文介绍BIRD算法的章节中添加实际的例子，来说明什么是rare category。图的解释也需要更加详细。

Where the paper could be improved is in showing how effective this tool

is. One of the experiment is on detecting four graph structures. But

first, it's not totally clear how these structures are useful to evaluate

rare categories labeling task. Second, the tutorial and training before

the experiment could easily bias the results of the user study, since

learning the visual encoding is probably pretty coupled with learning how

to visually detect a rare category. A discussion should be added about

the way to design a tutorial that doesn't directly teach how to discover

any of the 4 test features. Third, it would be interesting to have an

image to see how these four structures (clique, bipartite, star, circle)

look like in RCAnalyzer.

Answer: 在文中添加对rare category的结构的假设，并依据这样的假设来构造测试数据（BIRD算法对rare category的假设🡪系统设计时对各种类型的rare category的考虑🡪user study验证对假设的有效性）。详细描述参与者的训练过程，并讨论tutorial是否会影响最终实验的结果。在case study中可以考虑展示测试数据的结果。

I also wonder how this tool would compare in usability with the

state-of-the-art, how a power user would compare to a new user, how steep

is the learning curve, etc.

Answer: 在讨论中添加。

Since algorithms description has an important place in the paper, I would

give more precision on the claim that it's getting good results scaling

up to "over 8000 nodes, 200000 edges, and 6 time steps". A lot of things

can probably be optimized (before blaming Python as being the

bottleneck). And I assume that the reason that the frontend can handle it

is because it uses aggregation and filtering (d3.js typically uses SVG

which has some scaling limits), which would bring another reason to using

a hierarchical clustering.

Answer:对算法进行进一步优化，可能的话全部迁移到c++上，用python进行调用。

Revisions Required

The paper obviously can't be accepted without a professional

proof-reading (e.g. anomlous->anomalous, particular->particularly,

challenge->challenging (or "a challenge"), facilities->facilitates,

multi-foc->multi-foci, unfocued->unfocused, andtemporal->and temporal,

anomoly->anomaly, Gstaltlines->Gestaltlines, sankey->Sankey,

interested->interesting, iff-if, empty parenthesis "()",

traigles->triangles, wrongly placed hyphens, etc.)

------------------------ Submission 219, Review 3 ------------------------

Title: RCAnalyzer: Visual Analytics of Rare Categories in Dynamic Networks

Reviewer: external

Paper type

Technique and Algorithm

Expertise

3 (Expert)

Overall Rating

<b>3.5 - Between Possible Accept and Accept</b><br/>

Supplemental Materials

Acceptable

Justification

The paper could be publishable after a second revision cycle as the idea

is novel, well presented. The paper also have high quality illustrations.

However, the paper needs to be revised to address a few issues:

- important informations regarding the evaluation methodology needs to be

provided ;

- several typos needs to be corrected ;

- arguments for the design decisions should be provided ;

- limitations & (non-)expert findings should be improved.

The Review

The paper describes a technique using matrices, node-link diagrams and

dendrograms that may be used to visualize undirected dynamic networks and

hierarchies, and in particular, find anomalies.

Modified algorithms (e.g., finding rare categories, hierarchical

clustering) are also presented.

Evaluations were conducted; a case study, a user study, along with some

expert feedback.

INTRODUCTION

The problem of finding anomalies in evolving graphs is interesting and is

well introduced.

"The amount of abnormal individuals is usually very small, thus we call

them minority classes or rare categories"

=> Based on which previous work, is it usually very small and how small?

Minor aspects:

"... spies in a communication network, which may damage the development

of the entire graph" -> The sentence should be reworded as the words

"damage the development of the graph" have several meanings and it's not

clear which one is used here.

Figure 1 presents the whole system in a general way but also highlights

possible insights. (The caption should still clearly state what kind of

data e.g. citation network is visualized here at the beginning.)

Answer: 在figure 1的注解中加入对数据集的介绍。

RELATED WORK

There are indeed previous work focusing on finding (and visualizing)

anomalies but the combination with dynamic networks has not been explored

as much.

Another relevant paper regarding visual anomalies that discuss

techniques: Q. Liao, L. Shi, and C. Wang, “Visual analysis of

large-scale network anomalies,” IBM Journal of Research and

Development, vol. 57, no. 3, pp. 13:1–13:12, 2013.

"Many RCD methods requires prior information" -> the providing of

examples of the kinds of prior information needed would be useful.

Answer: 添加review提到的文献并进行讨论。

OVERVIEW

The 'Overview' section first starts as a background section and describes

the BIRD algorithm for rare category detection.

In presenting the design requirements, the concrete application domains

of the experts should be indicated to provide context to the iterative

requirements discovery process.

It's good that the requirements are further discussed later on to

illustrate how they are being used and also to make it clearer.

Given requirements R5 and R8, it should be precised if the BIRD algorithm

runs globally on all the graph history (R5), then the user may pick time

period (R8) and re-run BIRD once more to get more precise results.

Furthermore, for example, imagine a user wants to visualize timestamp t7

and compare it with t12. Will the technique show (and compute using BIRD)

intermediary timestamps or only t7 and t12?

Answer: R5和R8重新写，解释清楚BIRD算法是运行在两个时间点间的。我们也应该考虑让BIRD算法支持多个时间点的rare category检测，这样我们的流程就可以变成review所说的，先全局找rare category，再让用户选择时间点，重新进行检测后去看更精确的结果。

Figure 2 suggests the visualisation, and through interactions, may feed

the BIRD algorithm incrementally.

If that's the case, how does the algorithm improves over time? (vs. the

initial execution).

Morever, does the user have hints about what changed since the previous

iterations (to avoid restarting the analysis globally) -- e.g. is it the

ones provided in Fig. 11 or different ones?

Answer: 解释可视化系统是如何改变BIRD算法的结果的。

ALGORITHMS

The paper should more clearly state what specifically is different from

the original BIRD algorithm (also not presented in the algorithm

section).

There is one sentence describing one difference but it's not sufficient

and it's not clear if there are any other deviations? ("In this work, we

modify the query process of BIRD from single query single label to batch

query batch label").

To provide context, how the presented tree-cutting technique compares to

these?

-Dynamic Graph Clustering Using Minimum-Cut Trees, Journal of Graph

Algorithms and Applications. DOI: 10.7155/jgaa.00269.

-Coherent Time-Varying Graph Drawing with Multi-Focus+Context

Interaction. DOI: 10.1109/TVCG.2011.128

Answer: 在related work中添加tree cut和focus+context在图可视化中的运用，并比较已有方法和本文方法的优缺点。

SYSTEM DESIGN

The section describes the technique. Figure 6 is rather small but it's

good that the paper contains high resolution (zoomable) images.

It's not clear if the approach should be considered generic enough e.g.

for any type of dynamic network or more oriented towards finding

anomalies.

The paper acknowledge some issues for example that matrices are not space

efficient.

However, they also make it harder to track paths and edge directions.

Edge directions are not a problem here since directed graphs are not

supported by the approach.

However, the re-orientation of the matrices may make it even harder to

follow changes over time.

Moreover, why the choice of following a zigzag shape? is to reduce edge

crossings? for better space efficiency?

Triangle matrices may occupy less screen space, but they may also be

harder to grasp, or require more mental effort (given the dynamic aspects

as well). This seems like an important omission in discussing the design

(also not in the results or user feedback but more on this later).

Answer: 对矩阵的选择应该有更深入的讨论，包括选择上下三角矩阵的原因。

In the paper, the tracking of the removal/addition/modification of nodes

and edges, as well as clusters, could be made easier. In the sub-network

view, colors are used to show changes in iterations. Changes in terms of

the hierarchies have to manually be compared. Changes in the matrices

also have to be manually compared it seems. So, for tasks such as finding

the removed nodes over time may be difficult, as highlighting/filtering

and such are currently unsupported (as acknowledged).

Are such tasks out of scope in the paper? If yes, it should be clearly

mentioned. Otherwise, it should be better argued.

It also seems that a lot of movement is generated in some interactions

e.g. the selection of a new focus node, the dragging of elements, as seen

in the video.

Answer: 在层次结构和矩阵中添加一些细节的编码或是交互，来支持对节点/边的消失，增加，改变的分析（在目前的版本中，需要用户自己来对比，非常的低效）。

So, although not always indicated, it feels as some (but not all) design

choices were made as a compromise to save screen space.

However, it may also complicate the grasping of the visualization.

For example, rotated half (triangle) matrices of various sizes with may

require the user to mentally adapt to compare the changes at each

timestamp. (This is also shown in Figure 1 in trying to track changes in

(B) to (C).)

There are potentially many kinds of changes, such as the hierarchical

changes, the addition and removal of elements, possibly the changes in

node/edge attributes (which does not seem supported by the technique).

So, the learning curve, the mental effort to grasp the dynamic network is

probably higher in theses cases.

Were there any remarks from the users (experts as well as non-experts)

regarding such critical design aspects?

These aspects need to be better presented, argued and discussed in the

paper. (Which kinds of (the tracking of) changes are directly supported

by the approach. Which ones are left for future work.)

Answer: 在user study和discussion中添加对学习曲线、mental effort的调研和讨论。在user study中增加一些判断rare category的子任务，量化的评估目前的可视化方案在一些特定子任务下的有效性。可以先让用户做子任务（比如分析节点属性，节点周围结构变化等等），然后再让用户判断rare category。最后还应该做一个调查问卷，调研用户对系统的看法，包括易用性、可理解性等等。

EVALUATION

It's good to see multiple kinds of evaluation in this paper.

However, some of the design aspects were not argued enough and also not

discussed at all in the evaluation.

For instance, in the timeline view design, the paper argues that "the two

visualization forms have different emphases, the former emphasizes

vertices while the latter emphasizes links".

However, having both matrices and node-link views can consume more space

and potentially decrease the performance to complete tasks, but also

potentially lower error-rates.

Since the evaluation(s) does not cover these aspects at all, we do not

know in this particular case.

It should at least be mentioned as limitations and/or future work.

For example, it would have been interesting to know which view was(were)

considered useful by users and in which contexts / tasks ? But the

'Tasks' may be too generic or exploratory in nature (not necessarily a

bad thing).

Answer: 在user study中添加对各个可视化视图的有效性的评估。

The case studies show interesting (although not very surprising) use

cases.

In the first use case, it should be indicated if manual steps were

undertaken e.g. taking the largest component (filtering authors). If the

technique was used, the steps should be explained.

The three kinds of evaluations feel disconnected in the sense that they

do not directly relate to each other and separate datasets were used.

Probably if the same datasets, also relevant for the mentioned domain

expert users, were used, it would have been also very interesting.

Answer: 在case study中添加人工数据的case，主要展示系统是如何检测动态图中的rare category的；在user study中利用人工数据对系统的各个view进行测试，验证这些view对子任务的有效性，并验证rare category的检测效率；在expert review中让expert基于真实数据试用系统，与case study相印证，并调研expert对系统的态度。

The paper mentions a user controlled study but no classical quantitative

measures are reported (e.g. task time, correctness) and other details are

missing.

The specific datasets used in the evaluations may have various depth

level in the clusterings, edge densities. The paper should mention more

details about the experimental procedure, were there pauses, were the

participants tested for color blindness. In particular, results do not

show the time distribution among tasks, nor the iteration loop (average)

analytical time, which would have been useful. Were the participants

allowed to ask questions during their analysis?

These small details are required to be able to call this a fully

controlled experiment.

Answer: 按照review说的补充实验细节，并补充量化的实验结果。

Finally, the questions (tasks) are somewhat imprecise and incomplete. How

were they chosen? could these be mapped back to the requirements?

For example, expert users mentioned they were not sure about the usage of

matrices but non-expert users never mentioned this aspect at all. In

fact, the remarks of the non-expert users should also be summarized to

help investigate the question "to what level the design decisions made it

easier /harder to find insights?", a insight-based evaluation might have

been appropriate in this case. (See e.g., C. Plaisant, J. Fekete, and G.

Grinstein, “Promoting Insight-Based Evaluation of Visualizations: From

Contest to Benchmark Repository,” TVCG, vol. 14, no. 1, pp. 120–134,

2008.)

Answer: 参照review给出的文献，重新制定评估中的任务。

In the expert review, which is valuable although a bit short, the paper

should still mention if the experts participated or not in defining the

iterative features/requirements/design or if the experts were shown the

tool in its final version only and did not participate beforehand.

LIMITATIONS

Visualizing e.g. changes in hierarchies also seems difficult using the

technique. How to find which nodes disappeared over time? May the

technique be used to track changes between two arbitrary timestamps,

without having to browse all the intermediary timestamps?

The number of timestamps is small (6) ; was the system tested with a

large number of time steps?

How many hierarchical levels are supported (visual impact)?

A few words on these kinds of limitations should be added, and argued.

Answer: 层次结构的变化应该不是我们关心的变化。

OVERALL PRESENTATION & STRUCTURE

First, illustrations are of good quality and high resolution. In some of

these, it's difficult to map the (many) annotations back to the dashed

areas in the figure, especially as letters may be close to each other.

Small lines or arrows may help emphasize the discussed elements.

There are several typos and small mistakes in the paper, but these could

be fixed in a revision.

Examples : "Infomation Panel" (Figure 1), "anomlous", "rick context" =>

"rich context" (introduction), "anomoly", "we developed a series [of]

interactions" (2.2), "diue", "traigles", "thier", "a controlled user

studied [=> study]".